Synopsis

Ph.D in Human Development

Effectiveness of Developmentally Appropriate Practice-Based Curriculum Framework on Emergent Literacy and Numeracy Skills of Preschoolers

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I. INTRODUCTION

Early childhood is an important period in a child's life where development occurs and is seen through several stages of evolution and growth, as the child's development progresses physically, kinaesthetically, cognitively, emotionally, and socially (Sakellariou & Banou, 2020). Early Childhood Care and Education (ECCE) plays a crucial role during this stage as it lays the foundation for a child's holistic development and the period of rapid brain growth. The ECCE curriculum, designed for children aged 0-8 years, emphasises holistic development through diverse, engaging activities that nurture curiosity and prepare young learners for formal schooling.

The National Education Policy 2020 (NEP 2020) envisions a flexible, child-centric curriculum for preschoolers, ensuring an upward extension of learning aligned with their developmental needs. It underscores Developmentally Appropriate Practices (DAP), which promote optimal learning through strength-based, discovery-based, and play-based approaches, fostering joyful and engaged learning, as defined by the National Association for the Education of Young Children (NAEYC, 2017). It also focuses on capacity building for educators, equipping them to deliver inclusive and effective lessons, and emphasizes tracking learning outcomes through the National Curriculum Framework for ECCE (NCF-ECCE). This policy shift marks a significant turning point in recognising the importance of early education.

India has a population of more than 1.3 billion, and around 160 million children under the age of 6 years (UNICEF 2023). According to Nagaraj and Koushik (2024) India has seen a growing momentum to prioritise Early Childhood Care and Education (ECCE) in the recent years, despite existing challenges. Both the Ministry of Education and the Ministry of Women and Child Development are making sustainable efforts to enhance early childhood education.

The National Curriculum Framework for Foundational Stages (NCF-FS 2022) and the Aadharshila framework establish clear standards to develop quality ECCE programmes. Additionally, NITI Aayog has merged early education into its annual plans, emphasising key areas for ECCE as part of broader developmental goals under Viksit Bharat in 2047. These plans emphasise strengthening the Anganwadi system and integrating ECCE with primary education, focusing on quality infrastructure, teacher training and curriculum development.

Currently, ECCE is delivered through various channels in India, including Anganwadis, preschools, and kindergartens. Despite some progress in recent years, the status of ECCE in India remains a concern. According to a recent report by the National Statistical Office, only 48% of children in the age group of 3-6 years attend preschool or other pre-primary education programs (NSSO, 2019). This figure is significantly lower in rural areas, where only 38% of children attend pre-primary education. According to a World Bank assessment, in India, around 50% of the children lack foundational learning, and by the time they reach grade 5, it becomes difficult for them to grasp the teaching and learn as per the grade level (EAC-PM, 2023).

The National Education Policy (NEP) 2020 places a strong emphasis on the Emergent Literacy and Numeracy Skills as a crucial aspect of ECCE. Among its guiding principles, the highest priority is given to ensuring that every child achieves Emergent Literacy and Numeracy Skills by Grade 3. Recognizing the long-term impact of these skills on a child's academic success, NEP 2020 identifies its attainment as the most urgent national mission in education, aiming for universal Emergent Literacy and Numeracy by 2025. The policy highlights that without a strong foundation in these skills, children face difficulties in future learning, leading to gaps in comprehension, decreased academic performance, and increased dropout rates.

A study conducted by the National Council of Educational Research and Training (NCERT) found that the quality of ECCE programmes in India is poor, with a lack of trained teachers, inadequate infrastructure, and insufficient learning materials (NCERT, 2015). Furthermore, the report highlighted that the existing ECCE programs are not child-centred and do not cater to the diverse needs of children.

The study was conducted with the primary rationale of framing a DAP-based curriculum framework focused on Emergent Literacy and Numeracy Skills of preschoolers and implementing it in preschool settings, specifically designed for the Indian setting and evaluating its effectiveness in terms of enhancing the preschooler's Literacy and Numeracy Skills. In addressing these concerns, the study explored two research questions, 1) How can the globally acclaimed DAP in Preschool discourse help in overcoming the shortcomings? 2) Will the DAP-based curriculum framework focused on Emergent Literacy and Numeracy Skills be effective among preschoolers. With the research questions specified above, certain primary and secondary objectives of the study were framed as mentioned below:

Primary Objective:

To formulate a DAP based Curriculum Framework focused on Emergent Literacy and Numeracy Skills for 3-6 years old children

Secondary Objectives

1. To collate the literature on the context of the shortcomings of preschool programmes in India and apply the principles of DAP in overcoming these shortcomings
2. To assess the existing levels of Emergent Literacy and Numeracy Skills of the preschoolers and analyse the influence of socio-demographic markers on the same
3. To implement and appraise the effectiveness of the focused DAP-based curriculum framework in improving the gradations of Emergent Literacy and Numeracy Skills among selected preschoolers of 4-5 years

II. REVIEW OF LITERATURE

A. Early Childhood Care and Education in India - Evaluation and Present Scenario
B. Emergent Literacy and Numeracy Skills of the Preschoolers - Concept, Meaning and Significance
C. Developmentally Appropriate Practice (DAP) - Origin, Concept, Core Consideration and Principles as provided by NAEYC
D. Theoretical Framework of Developmentally Appropriate Practice-Based Curriculum
E. Conceptual Framework of the Study

III. METHODOLOGY

The study was conducted in two phases as given below and the methodology of each phase was as briefed below

Phase I: DAP as a tool to overcome the shortcomings of preschool programmes in India

Phase II: Emergent Literacy and Numeracy Skills of Preschoolers: Assessment and Intervention.

For Phase I, a qualitative method was adopted by using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) model to identify the shortcomings of the existing preschool programmes. This phase was aimed to answer the first research question - How can the globally acclaimed DAP in Preschool discourse help in overcoming the

shortcomings? A total of 60 studies were initially gathered from online databases such as Google Scholar, PubMed, SCOPUS, WOS, Shodhganga, and EBSCO using keywords related to ECCE in India. Due to the limited availability of India-specific studies online, manual searches in university libraries were also conducted to access less digitized materials. The collected articles covered ECCE challenges, policies, and recommendations. After a preliminary screening with certain inclusion criteria, 50 studies were considered for further review. On a second-level skimming, with elaborate inclusion/exclusion criteria, 20 studies were finalised to gain a deeper understanding. The findings of these studies were then systematically categorized according to the five key dimensions of Developmentally Appropriate Practices (DAP) as defined by NAEYC. This categorization helped in organizing the insights and ensuring a structured analysis of challenges, practices, and recommendations of existing Indian preschool programmes. Following this, the nine principles of DAP as provided in the position statement of NAEYC were mapped to the shortcomings in a way that the DAP principle when applied could substantiate strategies to overcome the identified shortcomings.

The Phase II of the study aimed to address the second research question: Will the DAP-based curriculum framework focused on Emergent Literacy and Numeracy Skills be effective among preschoolers? Phase II had two sub-phases namely

Sub-phase 1: Assess the performance of preschoolers in the Emergent Literacy and Numeracy Skills with the existing pedagogical framework.

Sub-phase 2: Formulate, implement and analyse the effectiveness of the DAP-based ECCE curriculum framework

For Sub-phase 1, a Cross-sectional research design was adopted and for Sub-phase 2 Before and After with a Waitlist Control Group research design was followed.

The methodology adopted for the same was briefed below

Population and Sampling: A total of 25 privately run preschools from all five zones of the Coimbatore District of Tamil Nadu were shortlisted. These preschools were either standalone preschools or preschools attached to private schools and were found to follow either a prescribed or a practice-based curriculum. Out of 25 preschools, only 5 preschools expressed their willingness to participate and these schools had a total of 281 preschool children for whom the parental assent was procured to be associated with the study. Henceforth, the population was 281 preschoolers.

For Sub-phase 2, from the 5 identified preschools, 4 schools provided consent and agreed to allocate specific structured hours over three months for implementing the DAP-based curriculum framework. These four preschools were divided into two groups: an experimental group and a control group, each comprising two preschools. Accordingly, a total of 62 preschoolers participated in the intervention process, with 31 assigned to the experimental group and 31 to the control group children under the age ambit of 4-5 years.

Tool Selection/ Construction: For Sub Phase 1, a total of two tools were used to get the necessary data from preschoolers. First, a self-formulated general background questionnaire to get the personal and parental profiles of the preschoolers. Second, a Modified Literacy and Numeracy Assessment Pack which was a modified version of the Kindergarten Common Core State Standards of North Carolina (2017). The pack comprised of two content areas namely, Emergent Literacy and Numeracy Skills. The Emergent Literacy Skill had two indicators, Reading (11 items) and Writing Skills (2 items) with a total of 13 items. The indicators of Reading Skills were Print Awareness, Listening Comprehension and Phonological Awareness skills and for Writing Skills, the indicators were Alphabet Writing and Number Writing. The Emergent Numeracy Skills had four indicators namely Numbers and Operations (4), Data analysis and Measurement (1), Algebra and Pattern-making (1), Geometry and Spatial Awareness (3) with a total of 9 items. As the pack was modified to hold good in the Indian context, the content was validated and it was pilot-tested.

For Sub-phase 2, a DAP-based curriculum framework was designed exclusively for preschoolers aged 3-6 years to suit the Indian context. This framework was formulated based on the globally recognized High Scope and Head Start curriculum. The blueprint of the framework was developed by identifying content areas and indicators, setting learning objectives, outlining milestones, designing learning pedagogy, and establishing methods for observation and evaluation. Each of these components of the curriculum was formulated based on the needs and context of Indian children. After subjecting the blueprint to expert evaluation for content validity, elaborate lesson plans for each of the objectives were also developed.

Although the framework was framed for children aged 3-6 years, owing to the time restrictions the framework was planned to be tested only with children of 4-5 years. The other reason for getting the framework tested with 4-5 years old children was their regular attendance in class when compared to pre-KG classes as this age group is considered to be the foundational stage of kindergarten. To implement the formulated curriculum for children of 4-5 years. The educators of the selected experimental schools (2) were trained for 7 days. Then, the

formulated focused DAP-based curriculum framework was implemented in the classroom by the trained educators. The implementation process was for 70 working days, with 1 session per day (a total of 70 sessions, 70 hours), and was monitored by the researcher.

Data Analysis: For Sub-phase 1, Percentage analysis and ANOVA were carried out. For Sub-phase 2, ANCOVA was computed to compare differences in mean scores on preschoolers' Emergent Literacy and Numeracy Skills between experimental and control groups of respondents and to check if the formulated DAP-based curriculum effect differs by time measures (Pre and Post) with an overall objective of evaluating the effectiveness of the formulated DAP based curriculum in enhancing preschoolers Emergent Literacy and Numeracy Skills.

IV. RESULTS AND DISCUSSION - KEY FINDINGS

The key findings were presented based on the two phases of the study

Phase I: DAP as a tool to overcome the shortcomings of preschool programmes in India over the benefits of DAP

The key findings of Phase I drafted in each of the five dimensions with the benefits of adopting DAP were as given below

- ✓ For the first dimension of **Constructing an appropriate curriculum in terms of content and strategies,** the key shortcoming was not having a unified curriculum with misalignment among learning standards and the question of how can DAP overcome these shortcomings. is based on the principle of DAP to align with the developmental standard and learning outcomes.
- ✓ For the second dimension of **Creating a caring community of learners,** the key shortcomings were classroom management, inappropriate teacher-student ratio and the lack of provision of teacher training. In terms of how can DAP overcome these challenges, the DAP principle if adopted in its true sense, extensive and periodic training of teachers becomes mandatory and the framework has its own classroom management principles.
- ✓ For the third dimension of **Teaching to enhance development and learning-** identified formal instruction**,** rote memorization lack of relevant teaching-learning materials, and inappropriate teaching methods were the shortcomings. It was conducted that the DAP framework as such if rolled out, its uniqueness in terms of experiential, play-based learning methods fosters critical thinking and aligns age-appropriate activities.

- ✓ The fourth dimension of **Assessing children's development and learning** had a key shortcoming namely, the lack of monitoring and evaluation framework for which the framework of DAP has all-encompassed components.
- ✓ The fifth dimension of **Establishing reciprocal relationships with families,** the shortcoming of preschools in India majorly lies in the lack of parents and community involvement. However, the DAP principles foster partnering with families.

Phase II: Emergent Literacy and Numeracy Skills of Preschoolers: Assessment and Intervention

The key findings were projected within the two Subphases:

Sub-phase 1: Assess the performance of preschoolers in the Emergent Literacy and Numeracy Skills with the existing pedagogical framework

A. General profile of selected preschoolers

- ✓ A great majority (55%) were within the age of 4 to 5 years, and 35% in the age group of 5 to 6 years.
- ✓ 52% were first born, and 48% were later born.
- ✓ 54% of the respondents were male and 46% were female.
- ✓ 33% were in the prescribed Preschool and 67% were in practice-based centres
- ✓ 77% were from nuclear families whereas 23% were from joint families
- ✓ Most of the respondents' fathers were graduates (43%), and very few (13%) were postgraduates
- ✓ 32% of mothers have completed their higher secondary level of education, followed by under-graduation (20%). Only a few mothers were postgraduates.
- ✓ 43% of preschoolers' fathers and 24% of preschoolers' mothers were involved in business endeavours. Moreover, 39% of the respondents' mothers were identified as homemakers. Additionally, the data indicates that 41% of fathers and 25% of mothers were employed in the private sector. On the other hand, 16% and 12% were government employees.

B. Categorization of the respondents based on the gradation of Emergent Literacy and Numeracy Skills

- ✓ Out of the total 9 indicators two indicators namely Listening Comprehension and Number Writing indicate that the practices adopted by the educator were much more appropriate to foster these skills.

- ✓ Few preschoolers in the age group of 3-4 years and 4-5 years were in the gaining stage in print awareness, mastery level in phonological awareness and Alphabet writing and approaching in all indicators of Numeracy Skills.
- ✓ More than $1/4^{th}$ of the preschoolers of 5-6 years were still in the initial stages of Print Awareness, frustration level in Phonological Awareness, basic grade in Alphabet Writing and just approaching in all the indicators of Numeracy Skills

C. Association between the socio-demographic markers and the Emergent Literacy and Numeracy Skills of the selected Preschoolers

- ✓ The ANOVA statistics show that gender does not have a significant impact on preschoolers' Emergent Literacy and Numeracy skills
- ✓ Listening Comprehension of Emergent Literacy Skills ($F(1,279)=2.804$ and $p=.095$) and the ability in Number and Operation of Emergent Numeracy Skills ($F(1,279) = 4.751$and $p=.031$) alone varied significantly based on birth order with firstborn scoring higher than their counterparts
- ✓ Emergent Literacy and Numeracy Skills of the preschoolers is independent of the type of family that the preschoolers hail from
- ✓ All the indicators of Writing Skills (Alphabet Writing and Number Writing with, $F(1,279)=4.053$ and $p=.040$ and $F(1,279)=4.642$and $p=.032$ respectively) were significantly associated with the type of preschool with preschoolers from prescribed preschool reporting enhanced score. Similarly, on the indicators of Emergent Numeracy Score, the ability in Number and Operation ($F(1,279) = 4.247$ and $p=.030$) alone varied significantly based on their type of preschool with prescribed preschool taking in a better position
- ✓ Number Writing of Emergent Literacy Skills ($F(4,276)= 3.884$ and $p=.004$) and two indicators of Numeracy Skill namely, Geometry & Spatial Awareness ($F (4,276) = 3.089$ and $p=.016$) and Algebra & Pattern making $F (4,276) = 5.215$ and $p=.000$) was significantly associated with the fathers educational status, with preschoolers of Postgraduate fathers obtaining a higher score when compared to their counterparts.
- ✓ Mother's educational status was found to have a significant association with Listening Comprehension and Phonological Awareness of Emergent Literacy Skills ($F(4,276)= 3.330$ and $p=.011$, $F(4,276)= 2.707$ and $p=.031$ respectively) and Algebra &

Pattern making of Numeracy Skill (F(4,276)= 2.890 and *p*=.023) with preschoolers whose mothers were postgraduates performed better than their counterparts

- ✓ Print Awareness alone was significantly associated with the Father's occupational status of the selected preschoolers (F (4,276)= 3.549 and *p*=.030), with preschoolers of fathers employed in the private sector performing better than their counterparts
- ✓ Mother's occupational status was significantly associated with only one indicator of Reading Skills, Listening Comprehension (F(4,276)= 2.926 and *p*=.034) and two indicators of Numeracy Skills namely, Geometry & Spatial Awareness (F(4,276)= 2.994 and *p*=.031) and Algebra & Pattern making F(4,276)= 4.380 and *p*=.005). with children scored mothers working in the government sector scoring higher.

Sub-phase 2: Formulate, implement and analyse the effectiveness of the DAP-based ECCE curriculum framework

The key findings were provided based on the Content areas and their indicators as given below:

A. Emergent Literacy Skills of Selected Preschoolers

i) Print Awareness: The ANCOVA analysis showed that the experimental group of respondents had an enhanced mean score {*M*(*SD*) = 15.238 (.272)} when compared to the control group {*M*(*SD*) =13.472 (.272)}**.** Further, the ANCOVA summary also showed a significant effect of intervention in the form of DAP-based ECCE curriculum with the η2 showing a low to moderate effect (0.249), hence a variance of 25%. The pairwise comparison further substantiates that the experimental group of respondents significantly had a better score on Print awareness compared to the control group of respondents.

ii) Phonological Awareness: The preschoolers of the experimental group showed a higher mean score{*M*(*SD*) = 44.375 (.940)} when compared to the control group {*M*(*SD*) =20.109 (.940)}. Consequently, the ANCOVA summary in terms of η2 showed a high effect size of 78%. In addition, the pair-wise comparisons portrayed a significantly augmented score of the experimental group when compared to the control group of respondents. Hence the DAP-based ECCE curriculum thus formulated and implemented was effective in the indicator - Phonological Awareness.

iii) Listening Comprehension: The score of the experimental group was slightly augmented compared to the control group but not statistically significant. A slight increase in scores

suggests that preschoolers naturally develop their Listening Comprehension Skills with the existing pedagogy. Also, the finding of subphase 1 showed that around 83% of the preschoolers had mastered the Listening comprehension with the existing pedagogy and thus the increase in the mean score of the experimental group of respondents was minimal.

iv) **Alphabet Writing:** The mean scores showed that the preschoolers from the experimental group showed a higher mean score {*M*(*SD*) = 7.585 (.172)} when compared to the control group {*M*(*SD*) =6.447 (.172)}. Further, the ANCOVA summary showed a significant effect of the formulated DAP-based ECCE curriculum framework on the Emergent writing score in terms of η2 showing a low to moderate effect size of 26% variance explained by the intervention. Also, pair-wise comparisons demonstrated that preschoolers from the experimental group scored better than their cohort.

v) **Number writing** The ANCOVA analysis showed that the preschoolers in the experimental group showed improvement in Number Writing compared to those in the control group {*M*(*SD*) = 22.970 (.808) and *M*(*SD*) =12.965 (.808) respectively}. Similarly, the ANCOVA summary in terms of η2 value (0.547) indicates a large effect size for the formulated DAP-based ECCE curriculum framework. This suggests that 55% of the variance in the pre-and post-test scores for Number Writing can be attributed to the intervention. Also, pair-wise comparisons demonstrated the same.

B. Emergent Numeracy Skills of Selected Preschoolers

i) **Number and Operation:** The results demonstrated that the experimental group of respondents had an enhanced mean score when compared to the control group {*M*(*SD*) = 19.174 (.342) and *M*(*SD*) =15.890 (.342) respectively}. The result of a significant ANCOVA summary revealed a η2 value of 0.434, indicating that the effect size was between low to moderate. This value suggests that 43% of the variance in the Number and Operation scores (pre- and post-test) can be attributed to the intervention. The effectiveness of the intervention was further substantiated by the significant pair-wise comparison scores.

ii) **Data Analysis and Measurement:** Preschoolers from the experimental group had an enhanced mean score{*M*(*SD*) = 7.315 (.134)} when compared to the control group and {*M*(*SD*) =5.330 (.134)}. Also, the ANCOVA summary shows that there was a significant effect of the DAP-based ECCE curriculum on the Data Analysis and Measurement. The η2 value (0.649) indicating a large effect size, suggested that 65% of the variance in the pre- to post-test scores of the experimental group is caused by the implementation of the DAP-based curricular framework.

iii) **Algebra and Pattern-making:** The result confirms that preschoolers in the experimental group achieved noticeably higher mean scores when compared to their peers in the control group {*M*(*SD*) = 17.787 (.376) and *M*(*SD*) =14.342 (.376) respectively}. Also, the ANCOVA summary shows that there was a significant effect of the formulated DAP-based ECCE curriculum on Algebra and Pattern-making. According to Cohen's guidelines, it can be seen that for the DAP-based ECCE curriculum, the effect size was between low to moderate (0. 414). Also, the pair-wise comparisons confirmed that the experimental group of respondents had an augmented score compared to the control group of respondents.

iv) **Geometry and Spatial awareness:** The ANCOVA analysis showed that the preschoolers in the experimental group were better{*M*(*SD*) = 7.365 (.161)} when compared to the control group{*M*(*SD*) =5.990 (.161)}. Also, the ANCOVA summary revealed that there was a significant effect of the DAP-based ECCE curriculum on Geometry and Spatial awareness. The η2 showed a variance of 54% which is explained by the intervention. Pair-wise comparisons also show that the preschoolers from the experimental group scored better than their cohort.

V. SUMMARY AND CONCLUSION

In conclusion, the challenges faced by preschools in India, operating in diverse settings, can be effectively addressed through a well-formulated DAP-based curriculum framework. The phase II findings highlight that 7 out of 9 key indicators were not adequately addressed in the existing classroom setting, underscoring the need for such a framework. Additionally, certain socio-demographic factors exert a varying yet tangible influence on preschoolers' emergent literacy and numeracy skills, ranging from minimal to moderate. Notably, the DAP-based curriculum framework demonstrated a significant impact on 8 out of 9 indicators, except listening comprehension, reinforcing its effectiveness in fostering foundational literacy and numeracy skills among preschoolers. Therefore, the formulated DAP-based curriculum framework focused on Emergent Literacy and Numeracy Skills can help bridge the gap and could significantly improve preschoolers Emergent Literacy and Numeracy Skills.

VI. RECOMMENDATIONS

- As DAP-based Intervention has a significant effect on the Emergent Literacy & Numeracy Skills of children within the age group of 4-5, further research can be carried out to test the formulated curriculum for 3-4 years and 5-6 years.

- The study also necessitates the completion of in-service training programmes by the educators to get themselves trained on an ECCE DAP-based curriculum.
- Further research can be conducted to investigate the long-term effects of formulated DAP-based curriculum on Emergent Literacy and Numeracy Skills as children transition from preschool to primary school, as it could provide valuable insights into how early DAP-based interventions influence later academic achievement and accomplishment of developmental milestones.
- A comprehensive framework can be developed to address all content areas and their relevant indicators of the early childhood period.

VII. IMPLICATIONS

For School/Centre Administrators

- Provides a structured framework to support the Emergent Literacy and Numeracy Skills of preschoolers
- Promotes initiatives that engage families and communities in the educational process, strengthening partnerships that enhance children's learning experiences.
- Necessitates educators' training to equip them with essential skills for effectively implementing the framework

For Educators

- Helps to create engaging and developmentally appropriate learning environments to enhance Emergent Literacy and Numeracy Skills of preschoolers
- Supports in customising DAP-based lesson plans that are tailored to the unique developmental needs and interests of young children
- Helps to schedule play-based and hands-on activities to foster children's curiosity and motivation while adapting instruction to meet diverse learning needs
- Offers guidance on assessing children's progress in a developmentally appropriate manner, allowing them to identify and support individual learning needs effectively

For Preschoolers

- Help them to builds a strong foundation in Literacy and Numeracy Skills which help them to meet later academic expectations
- Promotes positive learning attitudes that supports long-term academic success
- As it is designed to meet children's individual developmental needs, it helps reduce learning gaps and provides a more equitable foundation for preschoolers

For Community

- Helps foster collaboration between ECCE educators and community organizations, reinforcing common goals for children's educational outcomes, especially in Literacy and Numeracy.
- Helps address gaps in educational opportunities within the community, ensuring that all children have access to quality learning experiences

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